Thymus praecox subsp. *skorpilii* var. *skorpilii* and *Salvia triloba* possess anti-inflammatory and anti-diabetic effects on type 2 diabetic rats

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Background

The pathogenesis of type 2 diabetes mellitus (T2DM) and insulin resistance are associated with inflammation as a result of immune system activation.

Thymus praecox subsp. *skorpilii* var. *skorpilii* (TPS) is a species of *Thymus* from *Lamiaceae* have proven antioxidant effect. Other *Thymus* species have also shown antidiabetic effects in previous studies (1).

Previous studies have reported that *Salvia* species have antioxidant, anti-inflammatory and hypoglycemic effects. *Salvia triloba* (ST) is a subspecies of *Lamiaceae*, also.

There is no study has demonstrated their antidiabetic effects through the anti-inflammatory effects.

Material & Method

Sprague Dawley rats (200-300 g) were injected streptozotocin (STZ) 55mg/kg and nicotinamide (NA) 100mg/kg intraperitoneally (i.p.) to induce T2DM model.

Rats are divided into 5 groups:

- Control group (C)
- Diabetes group (DM)
- 1st therapy group (DM+T₁: Therapy with STE 200 mg/kg)
- 2nd therapy group (DM+T₂: Therapy with TPSE 100 mg/kg)
- Positive control group (DM+M: Therapy with metformin 400mg/kg)

On day 21, all rats were decapitated and blood samples were taken for evaluating tumor necrosis factor alpha (TNF- α), interleukin-6 (IL-6), interleukin-1 β (IL-1 β), interleukin-10 (IL-10) and adiponectin (ADP) levels by ELISA.

Results

Figure 1. TNF- α (a), IL-1 β (b), IL-10 (c), IL-6 (d), ADP (e) levels in serum. Data are expressed as mean $\pm$ SEM (n=6) and were analysed by ANOVA followed by Tukey's multiple comparison tests. ***p<0.001, **p<0.01, *p<0.05: vs. control group; ****p<0.0001, ***p<0.001, **p<0.01, *p<0.05: vs. diabetes groups.

Figure 1. Effects of STE and TPSE treatments on blood glucose levels. Data are expressed as mean $\pm$ SEM (n=6) and were analysed by two-way ANOVA followed by Bonferroni posttests. ****p<0.0001, ***p<0.001, **p<0.01, *p<0.05: vs. Diabetes group; ****p<0.0001, ***p<0.001, **p<0.01, *p<0.05: vs. control groups.

Discussion

- It has been showed that chronic, cytokine mediated, low-grade inflammation plays a key role in pathogenesis of T2DM (2).
- TNF- α and IL-6 was shown to increase in studies with type 2 diabetics compared to nondiabetics.
- IL-1 β is a pro-inflammatory cytokine was associated with development of T2DM in previous studies.
- The anti-inflammatory marker IL-10 was decreased in diabetic individuals compared to non-diabetic individuals. Furthermore, adiponectin which is known to low-level in diabetics, induces IL-10 expression, accordingly IL-10 levels are decreased in diabetic individuals (3).
- In our study TPSE and STE treatment decreased the level of proinflammatory cytokines TNF- α , IL-1 β , IL-6 but there is no significant difference in the level of IL-10 and ADP.
- Besides, STE showed more potential anti-inflammatory effect.

CONCLUSION

Due to the our results and evaluation of previous data obtained from plants in the same family, *Thymus praecox* subsp. *skorpilii* var. *skorpilii* and *Salvia triloba* have antidiabetic effects through the anti-inflammatory in T2DM. Further studies should be performed in order to be use in therapy.

References

1. Ozen T., Demirtas I., Aksit H., Determination of antioxidant activities of various extracts and essential oil compositions of *Thymus praecox* subsp. *skorpilii* var. *skorpilii*, Food Chemistry, 124(2011) 58-64.
2. Sinel M., Immediate and long-term effects of addition of exercise to a 16-week very low calorie diet on low-grade inflammation in obese, insulin-dependent type 2 diabetic patients. Food Chem Toxicol, 2011. 49(12): p. 3104-11
3. Butkowsk E.G., Jelinek H.F., Hyperglycaemia, oxidative stress and inflammatory markers, Redox Rep. 2016 Sep 22:1-8.